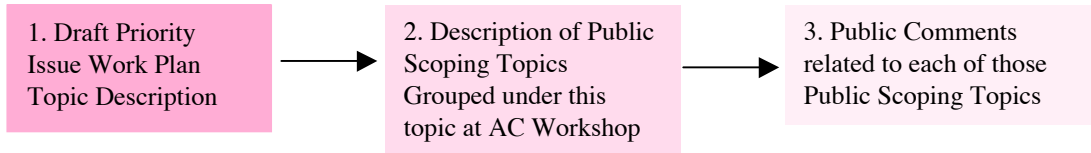


OCNMS MANAGEMENT PLAN REVIEW

PRIORITY TOPIC: *COLLABORATIVE RESEARCH, ASSESSMENTS & MONITORING TO INFORM ECOSYSTEM-BASED MANAGEMENT*

DEVELOPMENT OF TOPIC

This document shows the evolution of this topic (and its characterization) in reverse chronological order (so I guess it shows some kind of devolution or whatnot).



1. OCNMS STAFF’S DESCRIPTION OF THIS TOPIC FROM THE 03-2009 DRAFT PRIORITY ISSUE WORK PLAN (THIS DRAFT IS NOW DEFUNCT)

The OCNMS 2008 Condition Report, along with the comments received during scoping, emphasized the importance of data to inform management decisions, and also identified significant data gaps related to our understanding of some of the natural resources and ecosystem processes within the Sanctuary. When insufficient data exist, a precautionary approach to management decisions may be appropriate. An improved understanding of ecosystem processes, components, and their functions will facilitate informed ecosystem-based management and improve efforts to understand the effects of climate change on the marine ecosystem.

To maximize effectiveness of its efforts, OCNMS places a strong emphasis on maintaining and further developing collaborative scientific research and monitoring programs that address diverse aspects of habitat characterization, living resources monitoring, oceanographic and water quality monitoring, and climate change. Some monitoring and research efforts are led by OCNMS. In other cases, OCNMS may be a partner, providing technical assistance in the field, advocating for ship time or funding, or providing technical assistance with data analysis.

Climate change is widely acknowledged as a fundamental concern at the global scale that can impact local ecosystems and economies. Whereas there is considerable uncertainty about current and future consequences at local, ecosystem, and oceanic scales, it is likely that humans and marine life will experience consequences in our lifetimes and beyond. Given the magnitude and rapid emergence of this issue, OCNMS is using this management plan review as an opportunity to evaluate research and monitoring programs through the filter of climate change to determine best to understand changes to the local marine ecosystem resulting from this global pressure.

How will this priority management need be addressed?

Four working groups will be established, focused on habitat characterization, living resource monitoring, monitoring of oceanographic processes and water quality, and climate change. Working groups will be led by an Advisory Council member, consist of a few (e.g., 2-6) individuals, and meet one or more times, as necessary. To the extent practical, meetings will use electronic technology (i.e., emails, conference calls, internet conferencing) to facilitate scheduling and minimize transportation costs. The climate change working group will meet after the other three working groups have met, to enable use of their findings and recommendations for development of an action plan relevant specific to climate change.

Habitat Characterization Questions/Topics to Consider:

- Are the current priorities of OCNMS' habitat characterization program appropriate for future efforts?
- Three elements of habitat characterization were identified during scoping: mapping seafloor habitats, species-habitat associations, and the condition of physical and biogenic habitats – each of these topics should be considered.
- Is OCNMS' work, or to what extent should it be, consistent with strategies developed at WA Seafloor Mapping Workshop and its subsequent Strategic Plan?
- What is recommended for substrate and/or habitat characterization for areas for which high resolution acoustic data are not yet available?
- How can habitat characterization efforts best support fishery management needs, such as improved understanding of species-habitat associations and fishing impacts to seafloor habitats?
- To what extent do threats and identified impacts to seafloor habitats influence the prioritization of habitat characterization efforts?
- How can habitat characterization efforts help OCNMS and other managers move toward a comprehensive ecosystem-based management approach?
- How to integrate OCNMS efforts with those of Northwest Fisheries Science Center to better understand essential fish habitat?

Living Resource Monitoring Questions/Topics to Consider:

- Are key species identified in the 2008 Condition Report suitable choices for the purpose of living resource monitoring in the Sanctuary?
- How can living resource monitoring be designed to focus on abundance (status) and health (condition) of key species?
- How should ongoing long-term monitoring programs be modified to make best use of technology and address current science needs, including climate change research?
- What are the gaps in living resource monitoring and where should OCNMS focus efforts to provide critical data not collected by OCNMS or other agencies?
- Living resource monitoring during winter months is currently very limited. How can OCNMS and its partners address the need for monitoring data that covers the entire year?
- What are opportunities for maximizing collaborative efforts?
- How can natural resource monitoring support elements of ecosystem-based management, such as biodiversity, critical habitats, life history characterization and trophic interactions?
- How should monitoring for non-indigenous or invasive species be prioritized?

Oceanographic/Water Quality Monitoring Questions/Topics to Consider:

- Discuss the state of knowledge of oceanographic processes in OCNMS.
- How does the Sanctuary's ongoing nearshore water quality monitoring program contribute to and augment similar efforts in the California Current?
- What is the unique role for OCNMS in oceanographic monitoring?
- How can oceanographic monitoring be improved to address our emergent need to understand effects of climate change, such as ocean acidification?
- How should OCNMS fit into the larger Integrated Ocean Observing System (IOOS) system and investments being made by NOAA and others in IOOS?
- Do existing programs, such as IOOS, WCO and SIMoN, provide sufficient opportunities for data sharing, and how should OCNMS work with these groups to share data?
- The most significant water quality issues identified in the 2008 OCNMS Condition Report are impacts of harmful algal blooms on animal health (including humans) and hypoxia. How can OCNMS best focus its efforts to address these issues?
- Where does the "Big Eddy" fit into ongoing monitoring and research efforts?
- Where does the Columbia River plume and potential advection from Hecata Banks fit into ongoing monitoring and research efforts?

- What monitoring should OCNMS or others conduct to assess potential degradation of water quality?

Climate Change Questions/Topics to Consider:

- How do current research and monitoring efforts support an improved understanding of climate change and its impacts on Sanctuary resources?
- How can existing monitoring programs be adapted to provide data that is relevant to climate change?
- What additional monitoring is recommended?
- What are key partnerships that should be fostered to enhance climate change monitoring?
- What ecosystem-level research questions should be pursued in the context of climate change monitoring?

2. PUBLIC SCOPING TOPICS GROUPED TOGETHER BY ADVISORY COUNCIL (AT JAN. WORKSHOP) UNDER HEADING “COLLABORATIVE RESEARCH TO SUPPORT EBM”

Climate Change

Description	Ongoing changes to the climate and marine ecosystem have been documented, yet there is considerable uncertainty about current and future consequences at local, ecosystem and oceanic scales. Increased coordination and cooperation among resource management agencies would improve planning, monitoring and adaptive management to address this phenomenon. Monitoring data can serve as a baseline from which to assess changes in the coastal ecosystem that may occur as a result of climate change.
Focus of comments	Comments suggest there should be an assessment of vulnerabilities, predictive modeling, and identification of key species susceptible to impacts and/or appropriate for monitoring. Baseline and long-term monitoring should be conducted and focused on climate change; partnerships improved to expand monitoring and research efforts. Paleoshoreline studies could provide historical context for resource use and inform studies of impending shifts in species abundance.
Status	<p>The 2008 OCNMS Condition Report noted early evidence of environmental changes in the region linked to human-influenced climate change, but that some linkages are uncertain. This is a rapidly developing body of knowledge (e.g., the December 2008 paper by Wootton et al. on ocean acidification at Tatoosh Island).</p> <p>OCNMS has contributed to long-term monitoring including kelp, intertidal and subtidal invertebrates and macroalgae, seabird and marine mammal abundance, distribution, and mortality rates, and since 2000 has studied nearshore water quality and movement. In general, these programs have not been analyzed specifically for their utility to support climate change research; however this work contributes to programs that do examine climate change.</p>

Ecosystem Impacts of Fishing

Description	Uncertainty exists related to ecosystem-level impacts from physical disturbance to seafloor habitats and effects of biomass removal from
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fishing within the sanctuary area. An ecosystem-based management approach that considers potential impacts of fishing can promote sustainable fisheries.

Focus of comments	Comments suggest that the Sanctuary should promote ecosystem-based fisheries management, prohibit fishing practices that damage seafloor habitats from all or portions of the Sanctuary, protect biogenic habitats where they are located, and protect rockfish populations that appear to be in decline.
Status	The 2008 OCNMS Condition Report notes that information on past and present locations of biogenic habitats within the Sanctuary is sparse. Because bottom trawl and longline fisheries can damage biogenic habitat and have been practiced widely throughout the Sanctuary, the report assumes habitat damage has been widespread. Reduction of fish biomass has led to some depleted species, but recovery plans and management practices have led to recovery of some overfished stocks. Poor understanding of ecological processes makes it difficult to determine the ecosystem level impacts of these practices. In association with its habitat mapping and characterization program, OCNMS conducts surveys to identify locations of habitat-forming corals and sponges that are vulnerable to physical disturbance, and documents species-habitat associations (including fish) and collects information on physical disturbance to seafloor habitats. Survey effort for this expensive work has been limited by funding and generally requires grant funding beyond the sanctuary budget.

Fisheries Stock Assessment

Description	Stock assessments provide important information about the health of fish populations and serve as the foundation for many fisheries management decisions. Some believe that current assessments of groundfish stocks off Washington are inadequate for management of groundfish on a regional basis, and that improved fisheries stock assessments for the Washington coast will assist fisheries management decisions.
Focus of comments	Numerous public comments request the involvement of the Sanctuary in fisheries stock assessment work and specifically note that current assessments of groundfish stocks off Washington are data poor and inadequate for regional management of the fishery (as opposed to coast-wide).
Status	The 2008 OCNMS Condition Report notes indications that some groundfish stocks off Washington have a relatively high biomass. However, existing data for most targeted groundfish species have not been analyzed to determine if stocks off Washington are more abundant than those off Oregon and California. As background, when the Sanctuary was designated in 1994, NOAA determined that, at that time, existing fishery management authorities were adequate to address fishery resource issues. Thus, OCNMS has not been involved in assessing the status of fish stocks, work that is currently conducted by Northwest Fisheries Science Center. OCNMS has been mapping seafloor habitats and documenting fish use of different habitat types. Sanctuary staff and fisheries managers have initiated discussions to

identify how OCNMS' research programs can collect data to support fisheries management needs.

Habitat Characterization

Description	The Sanctuary and its partners have made progress mapping habitats in the Sanctuary, but much work remains to be done. There is a need to complete characterization of seafloor habitats and identify species-habitat associations to effectively inform management decisions.
Focus of comments	Comments included the need to complete seafloor mapping work as a means to characterize benthic habitat, its condition, and associated species. This should be a high priority, with focus on habitat forming species (deep sea coral and sponge communities). Goals should include accessing existing data collected by the Navy and sharing data with partners.
Status	The 2008 OCNMS Condition Report notes that intertidal habitats of the outer Olympic Coast are fairly well characterized. Nearshore habitats remain poorly characterized except for the distribution of kelp. Since 2001, OCNMS with assistance from our federal/state partners has conducted approximately 20 high resolution acoustic surveys in support of our seafloor habitat characterization efforts, mapping an estimated 25% of the Sanctuary. This continues to be a major emphasis for the Sanctuary. Three research cruises have included efforts to collect information on benthic communities and species associations. Although the condition of seafloor habitats was not documented before large-scale commercial activities began, video surveys have been conducted in limited areas and provide evidence of disturbance to physical structure and biological communities.

Living Resources Monitoring

Description	Long-term monitoring of biological resources is critical to the successful management of the Sanctuary. Long-term and collaborative monitoring is required to assess the current status (abundance) and condition (health) of key species in the Sanctuary, as well as seasonal and multi-year trends.
Focus of comments	Comments support continuation of existing long term monitoring work, as well as monitoring biodiversity and the status and condition of key species, specifically high order predators, threatened or endangered species, seabirds, salmon, larval fish, and kelp. Recommendations included year round monitoring, increased use of technology, focus on collaborative efforts, and monitoring for impacts of climate change.
Status	The 2008 OCNMS Condition Report reviews living resource monitoring supported by the Sanctuary and its partners in the context of biodiversity, extracted, non-indigenous, and key species, and impacts of human activities. In collaboration with multiple partners, OCNMS has contributed to long-term monitoring of kelp, invertebrates and macroalgae, and seabird and marine mammal abundance, distribution, and mortality rates, ranging from intertidal areas to the deep seafloor.

Non-point Source Pollution

Description	Runoff from upland sites may contain pollutants, including toxins and pathogens. Understanding of the types and sources of non-point source pollution is essential to OCNMS' ability to address potential impacts to sanctuary resources.
Focus of comments	Comments focused on linkages between upland activities, particularly land clearing, and erosion, runoff of sediment and toxins into OCNMS.
Status	The 2008 OCNMS Condition Report mentions a suspected but indefinite link between increased sediment and turbidity contributions from freshwater systems and declines in kelp beds near river mouths. Improved land management may have reduced impacts, but this has not been monitored. Historic practices (e.g., roads and culverts) continue to impact freshwater systems entering OCNMS. Atmospheric sources of contaminants are identified as a growing concern. OCNMS contributed to a comprehensive study of sea otter health that analyzed pollutants and pathogens levels in otters and their prey, and investigated potential routes for pathogen exposure, including a linkage between pathogens in domestic cats and sea otters. In 2003, OCNMS participated on U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program that sampled sediment, water, and fish tissue samples from the West Coast, including stations in OCNMS, for contaminants. NOAA's Status and Trends program has long term data for mussel tissue concentrations of chemical pollutants.

Research to Support Ecosystem Management

Description	Improved understanding of ecosystem processes and functions will benefit OCNMS by informing management decisions. A scientific research program that focuses on ecosystem-level processes, species-habitat associations, and interspecies interactions and is conducted in collaboration with partners is essential.
Focus of comments	Comments suggest that OCNMS collaborate in and coordinate research efforts, identify and study key indicators of ocean health, use historic information to assess long term ecosystem changes, improve understanding of human and other apex predators influences on the system, study all life stages of organisms, monitor for biodiversity, research linkages between physical, chemical, and biological ocean processes, and study interspecies dynamics. In the context of ecosystem based management, sanctuary research also could inform regional fisheries management efforts.
Status	The 2008 OCNMS Condition Report addresses many elements of ecosystem health and discusses research findings relevant at the ecosystem level. However, the report acknowledges that species-habitat associations, trophic level interactions, and connections between oceanic processes and biological productivity are not well understood. Seafloor habitat and benthic species surveys, nearshore oceanographic monitoring, COASST surveys for dead birds and marine mammals, and marine mammal and seabird surveys supported by OCNMS and federal/state partners all improve our understanding of ecosystem-level processes, yet there is ample opportunity to augment these studies to improve our understanding of ecosystem processes. In addition, OCNMS has collaborated in ecosystem-level studies of the California Coastal Current system and has co-sponsored regional workshops on the

Big Eddy ecosystem.

Water Quality Monitoring

Description	Biological resources and their dependent uses, as well as human health, can be impacted by degraded water quality. Water quality monitoring off the Washington coast should involve collaborative efforts that should focus on improving understanding of physical and chemical processes, assessing potential degradation of water quality, monitoring ecological impacts, and improving data sharing.
Focus of comments	Comments recommended collaborative monitoring of biological, chemical, and physical oceanographic parameters, with focus on harmful algal blooms and depleted oxygen. Improved use of remote sensing and citizen science was called for, as well improved data sharing.
Status	The results of water quality monitoring informed the 2008 OCNMS Condition Report, which assessed natural and cultural resources. In general, water quality in the Sanctuary received a good/fair rating, with pressures based on low oxygen, naturally occurring harmful algal blooms, and the threat of an oil spill. Since 2000, OCNMS has deployed instrumented oceanographic moorings in the nearshore on a seasonal basis to monitor biological, physical and chemical parameters of marine waters. In recent years, OCNMS has collaborated in regional monitoring programs and has added instrumentation to monitor for depleted oxygen (hypoxia). OCNMS collects baseline water quality data along fixed transects on periodic research cruises, supports monitoring programs conducted by others, and has contributed to studies of harmful algal blooms and pathogens in nearshore species.

3. SELECTED PUBLIC SCOPING COMMENTS RELATED TO EACH OF THOSE TOPICS GROUPED BY THE AC UNDER/INTO THE RESEARCH TO SUPPORT EBM TOPIC:

5. CLIMATE CHANGE

- Documenting the condition of existing habitats is a prerequisite for, among other things: getting baseline information to gauge the likely looming effects of climate change.
- Though they may not yield useful results in the short term, long-term monitoring projects will be essential for OCNMS to understand how climate change affects its resources.
- Given the current expectations for global climate change, I believe that it would be a very good idea for the sanctuary to support more paleoenvironmental research. It may be possible to model and plan for possible changes. For example, there are several archaeological sites on the Olympic Peninsula that are associated with a relatively higher sea level than at present. The animal remains (and in one case so far, plant remains) in these archaeological sites can shed light on the nature of the marine environment in the area, when sea level is higher. The human/marine environment interaction can be traced through time, which will shed light on management issues (known archaeological records of more than 4,000 years of interaction). Research in non-archaeological sites (such as lake bottom sediments) can help separate the human and natural factors in the human/environmental interaction.
- In its preparations for climate change, OCNMS should focus primarily on adaptation rather than mitigation efforts. . . OCNMS should concentrate projects and plans on adapting to the changes brought by rising temperatures and more intense weather events. . . Throughout the planning process, OCNMS should utilize many of the resources available through the U.S. Climate Change

Science Program (CCSP), NOAA, and U.S. Environmental Protection Agency (US EPA). In addition to reports, OCNMS should try to learn from other areas and programs that have been working to prepare for the uncertainties of climate change. . . In addition to learning from specific areas and other Sanctuaries, OCNMS should utilize information from estuary programs as well.

- In order to begin preparing for the effects of climate change, OCNMS should conduct a vulnerability assessment of as much of the Sanctuary's resources as possible. . . The US EPA recently developed a program to prepare estuaries for the effects of climate change. Their new program Climate Ready Estuaries (www.epa.gov/cre) has developed an extensive coastal toolkit with information on adaptation planning and tools as well as example vulnerability assessments conducted in coastal areas. Information from some of these example assessments may guide OCNMS in completing one of their own. The program is currently working with six pilot estuaries to improve their management of uncertainty. Information and lessons learned from these pilots should be ready and available soon for OCNMS to utilize.
- Monitor conditions and trends, particularly indicators and sensors of climate change, for oceanic conditions, physical and chemical features and processes, and marine biota.
- Develop adaptation needs, strategies, and potential management actions for climate change.
- Sanctuaries should be places where basic long-term natural resource monitoring is done as a consequence of designation. At a minimum NOAA should be archiving their own satellite data to track seasonal changes in temperature and primary productivity in the nation's 13 Sanctuaries, but this is not done. These data will enable the Sanctuary program to provide an archive of the impacts global climate change is having on our nation's marine habitats.
- Increased coordination and cooperation between resource management agencies are required to improve planning, monitoring and adaptive management to address global climate change. The Sanctuary should look to partner with the Makah Tribe, weather and climate experts within NOAA, and the University of Washington to better understand the role of the ocean past, present and future in climate change. We need sustained observational systems and data delivery systems at a coastal scale, including oceanographic, geophysical, hydrological, chemical, biological and geological. Data collection points could be increased through more sophisticated monitoring buoys which could assist in developing models for tsunami source, seafloor stability models, land subsidence, and storm formation.
- Assist Tribes, state and federal agencies in developing strategies to prepare for and respond to climate change.
- Ocean acidification could be detrimental to calcifying organisms and potentially have ecosystem-altering effects, but the extent of ocean acidification is not being monitored in the sanctuary. With monitoring infrastructure already in place for many aspects of the sanctuary's oceanographic conditions, the management plan should look into including the monitoring of pH changes in the sanctuary's ongoing research program.
- Ideally, OCNMS and the nation's 13 other marine sanctuaries should serve as a network of sentinel sites detecting ocean-wide changes caused by global warming, including ocean acidification. This is particularly pertinent for the OCNMS since the calcite and aragonite saturation horizons in the Pacific are historically shallower than other regions.
- OCA recommends that OCNMS place greater emphasis on monitoring climate change and its impacts within the Sanctuary. Changes in ocean temperatures and currents are important factors in assessing the condition and expected trends in Sanctuary health. Monitoring of climate impacts on glaciers in Olympic National Park is ongoing. The Sanctuary should establish sentinel monitoring sites to augment this important research.
- Climate Change Monitoring, Research and Adaptation.[should be a priority topic]
- The OCNMS should include in its new management plan both a research program directed at studying the effects of climate change and resource protection provisions designed to enhance the capacity of sanctuary resources and ecosystems to adapt to climate change.
- A wide variety of human impacts act to reduce resiliency and therefore make ocean ecosystems more susceptible to climate change. Thus, to enhance the capacity of ocean ecosystems to withstand and absorb the impacts of climate change they must be maximally resilient. In most places, this requires removing or minimizing anthropogenic stresses in order to give the ocean a

chance to recover fully resilient. We encourage the National Marine Sanctuary System to take a proactive role in climate change research, monitoring and adaptation throughout all of the sanctuaries. Specifically, the OCNMS draft management plan should include a climate change action plan. We encourage the OCNMS to coordinate with efforts and activities already underway in the Channel Islands, Gulf of the Farallones and Cordell Bank sanctuaries on this important issue.

- Incorporate a modeling component to the [kelp] monitoring program to assess how the physical effects of climate change may impact the density and distribution of the kelp canopy.
- How kelp bed distribution and health is impacted by climate change could fundamentally effect the nearshore habitat. Not only might the abundance and distribution of fish and invertebrate species be shifted but any reduction of the protective function kelp forests provide would cause increased exposure of the nearshore to the physical forces of waves and currents. The nearshore would experience changes in sediment transport and that would affect the geomorphology of the bed and change the shape of the beaches and shoreline. Incorporating a modeling component into the kelp monitoring would allow for some predictive capacity and a better understanding of the potential changes that will need to be addressed to best protect the Sanctuary resources.
- Expansion of the kelp monitoring program to: 1) capture the site scale changes that have been reported, 2) include a climate change modeling component, and 3) incorporate monitoring of additional macroalgae would significantly strengthen the Sanctuary's management plan. These changes would address two of the five priority topics to be addressed by the revised management plan *Characterization and Monitoring*, and *Climate Change*. Including an expanded macroalgae monitoring program as described above in the OCNMS Management Plan would allow for improved characterization of the Sanctuary resources, and the ability to more effectively respond to acute and long term environmental stressors.
- [W]e encourage the sanctuary to continue monitoring water quality using mooring stations and to collect data to better understand global climate change induced impacts such as ocean acidification, temperature changes and hypoxic events.
- Climate change will have dramatic effects on the Sanctuary. In order to monitor these changes and understand the dynamics of the area, adequate equipment must be deployed to gauge dissolved oxygen, salinity, temperature, and subsurface current flow. This could be achieved by deploying year-round enhanced mooring buoys equipped with the proper sensors.
- [I]ncorporate research into the effects of climate change. Collectively, national sanctuaries can offer great insight into the impacts of climate change on ocean ecosystems.
- Monitor ocean acidification and other climate related impacts.
- Surfrider Foundation feels that climate change should be highlighted as a separate priority in the Management Plan.
- The sanctuary should do more work on deep-sea corals and deep-sea communities in order to monitor for climate change.
- Specifically what is the role of sanctuary with climate change research?
- We need more geological research specifically focused on paleo-shoreline and sea level history over the past 20,000 years.
- Monitor the effects of ocean acidification and other effects of climate change within the sanctuary.
- Evaluate existing monitoring programs, and determine effectiveness in detecting climate change effects within the sanctuary.
- Make proactive efforts to monitor for climate change effects in the sanctuary. Link to the National Park's efforts, National Oceanic and Atmospheric Administration (NOAA) work (e.g., R. Feely) and others within a network. This could tie into the Ocean Observing Systems.
- Consider prioritizing research on ocean acidification and its potential effects on species within the sanctuary.
- A program to monitor the interspecies dynamics of increased abundance warm water species such as tuna and pelican. How are these changes affecting the ecosystem and what are these species eating (stomach contents analysis)?
- Sanctuary should maintain regular data to investigate carbon sequestering and ocean acidification. Need baseline data. Monitor key species that may be affected by acidification. Coccolithophores

- The sanctuary should focus research programs to conduct monitoring on decadal scale. The program needs to be sufficient to conduct continuous long-term monitoring. The current research programs are not focused enough (i.e. detect changes cause by climate changes).
- Resource management needs to identify resources at risk and address potential impacts of climate change.
- Oceanographic long-term monitoring should be undertaken to document what is happening with climate change (chemistry, water temperature, etc). Short-term monitoring is not enough.
- Low oxygen problem. Need continued focus, improved understanding of oceanographic and climate change linkages.
- Understand impacts of climate change
- The sanctuary needs to find a way to fund “spiders” on existing buoys that monitor ocean acidification. The degree of ocean acidification is extremely important to monitor.
- The sanctuary should research how global warming will affect resources in the sanctuary.

8. ECOSYSTEM IMPACTS OF FISHING

- Archeological sites contain information that can be used to understand the ecology of present systems which could help us with resource management (e.g., look at things in the past before management issues such as overfishing were occurring).
- The sanctuary should pursue a policy of ecosystem-based management, which should focus on interaction of all elements of ecosystems, including humans as element of the system.
- The sanctuary should keep the draggers out of the sanctuary. Draggers (bottom trawling) are tearing the bottom up.
- Sanctuary should undertake more coral biomass research – not just taking pictures of the resources but estimating the biomass of the coral resources, for example in areas not accessible to fishing gear as well as fished areas.
- Analysis of fisheries impacts or levels of impacts, what impacts have been sustained.
- Create areas to be avoided by trawlers and identify rocky areas that could be utilized by corals and sponges.
- The apparent ineffectiveness of the existing management plan in protecting the sanctuary resources from 1) the likely expansion of the Navy's test range into the sanctuary, 2) the unknown effects of the experimental wave-energy project, 3) destructive fisheries
- While it may not want to get involved in helping to determine catches, the Sanctuary should prohibit damaging fishing techniques within its boundaries, such as bottom trawling.
- The OCNMS should also establish some marine reserves that are protected from fishing, even if these reserves are small. These can serve as important refugia that restock adjacent damaged or overfished areas.
- I would like to offer a comment in support of the strongest possible protections for the rockfish (particularly Tiger, China, and Canary) in danger of extirpation off of our state's coast. Survey data indicate that these populations are far too low to allow further harvesting or incidental take.
- Continued work with tribes to minimize impacts from their fishing and harvesting including closures when needed
- No fishing areas to let populations recover and expand
- Please close the rockfish fishery for the foreseeable future. Populations of China Rockfish, Tiger Rockfish and Canary Rockfish in the portion of the Marine Sanctuary encompassing Tatoosh Island, the entrance to the Strait of Juan de Fuca, and Neah Bay are reported to have declined greatly, and are currently under heavy fishing pressure by recreational fishers.
- I support stronger fishing and harvesting restrictions within the Marine Sanctuary along with continued awareness and action regarding invasive species.
- Protection of benthic infrastructure is of critical importance to the maintenance of healthy ecosystems, particularly where fisheries species associated with fragile benthic communities are targeted by destructive fishing practices (e.g., trawling for some species of Rockfish). Cold water and deep water benthic communities are known to be slow growing, with unknown recruitment/recovery rates, therefore management practices should be pro-active and conservative.

- I am greatly concerned to learn that numbers of fish, particularly rockfish, has declined significantly in recent years. Encourage you to place stringent limits on the exploitation of these resources.
- I would like to ask that you please consider managing the OCNMS rockfish population with an eye to preserving one of the few places in Washington where divers can see these long lived but elsewhere critically depleted species. The populations of rockfish in the sanctuary are presently suffering as a result of fishing regulations which are not sufficient to maintain sustainable breeding populations of these fish. . . .I suspect that as we try to rebuild rockfish populations throughout Puget Sound and the San Juans we will rely on seeding from places like the OCNMS - we need a sustainable population from which to base the recovery.
- No trawling should be allowed, nor any other type of fishing. Areas where fishing is outlawed experience major rebounds of species. The sanctuary should be a no-fishing zone, otherwise we will never have a natural ecosystem.
- Compatible use and close monitoring of fisheries can assure limited activities in some areas while other areas are "off line" and recovering, serving as nurseries for outside harvest areas.
- Help to prevent overfishing and contribute to recovery of depleted fisheries. For example, consider designating marine reserves and refugia.
- Prohibit or adequately restrict fishing techniques that damage the sea floor, such as, bottom trawling and long lining.
- We remain concerned by the effects of bottom trawling on seafloor habitats within sanctuary waters. In 2002, the National Research Council published the report, *Effects of Trawling and Dredging on Seafloor Habitat*, which provides an independent, objective and critical review of scientific literature and reports on bottom trawling impacts. The National Research Council (NRC 2002) concluded that bottom trawling alters the seabed and marine life by: reducing habitat complexity; altering seafloor communities; and reducing habitat productivity. Bottom trawl gear, consisting of expansive nets plus steel doors, chains and footrope gear, is dragged across the seafloor, knocking over living, habitat-forming invertebrates, suspending sediments into the water column, compressing the seafloor, displacing boulders and digging into sandy habitats. We encourage the Sanctuary to protect sensitive habitats and resources from the destructive impacts caused by this fishing practice.
- The National Marine Sanctuaries Act and the Magnuson Stevens Fishery Conservation and Management Act are both important pieces of legislation administered by NOAA. While they should be administered in a compatible manner, they have different purposes and mandates that are not always complementary. Each year NMFS authorizes industrial fisheries that remove thousands of metric tons of living marine resources like whiting, rockfishes and salmon from sanctuary waters. It is becoming increasingly clear that fishing affects more than just targeted species--it affects the entire ecological community. Through the direct removal of targeted fish species, indirect competition with ocean wildlife, bycatch of non-target species and habitat damage induced by destructive fishing gear, commercial fisheries affect the marine environment and resources of the sanctuary. It is important that the Sanctuary work closely with the National Marine Fisheries Service and tribes to ensure that ocean fisheries are managed in an ecologically sustainable manner. We recommend that the OCNMS management plan include direction to work closely with NMFS in the development of an ecosystem-based fishery management plan that consider ocean fishery management in the context of a vibrant and healthy ocean ecosystem, rather than in the context of single species managed for maximum yield objectives.
- With regard to habitat protection within the Sanctuary, we first urge NOAA to work with trawl vessel owners and operators to ensure that the impacts of their gear - known to be damaging to sensitive benthic habitats - is minimized. This may be done through area-based restrictions around known sensitive habitats such as corals and sponges. In addition, considerable investment should be made in cooperative research that offers opportunities for fishermen to design and participate in studies that demonstrate effective use of selective fishing gears and methods. From an economic stand point, restoration of the marine environment is exponentially more expensive than precautionary efforts to preserve sensitive areas. Furthermore, precautionary management

measures within the Sanctuary are in keeping with your mission statement to “preserve the area’s ecological integrity.”

- The discovery of deep-water corals and sponges in the Sanctuary indicates the importance of this area of the coast. Unfortunately, these organisms are extremely susceptible to damage associated with human activities, including some types of fishing and geological exploration. It is therefore imperative that these organisms receive full protection. Please note that under the reauthorization of the Magnuson Act, protection of organisms other than fish in our waters is now authorized.

9. FISHERIES STOCK ASSESSMENT

- I would like to see OCNMS work with government entities in doing stock assessments of fish.
- The OCNMS is home to a vast array of fishes including salmon, lingcod, cabezon, kelp greenling, halibut and many species of rockfish. Some, such as lingcod, have high site fidelity to individual reefs, while others such as Pacific whiting (hake) traverse waters along the West Coast. We believe that some of the most pressing problems in our fisheries – bycatch and overfishing for example -- have occurred because management actions have inadequately accounted for spatial variability of the resource. While west coast salmon and groundfish fisheries face crisis after crisis, fishing effort in the usual and accustomed fishing grounds of Washington’s coastal Treaty Tribes - and therefore in the OCNMS - is increasing. We feel strongly that NOAA, state agencies, and tribal councils should do everything possible to manage and steward this area with caution and foresight, using the best available science. With regard to biophysical processes in the region, nearshore demersal habitats tend to be vastly different from deeper offshore areas of the continental shelf and slope. Nearshore regions are typified by “sticky water” with very low alongshore movement. Offshore regions are generally colder, lower oxygen, and stable ocean environments with much stronger alongshore advective processes coming into play in the pelagic region (Francis et al. 2008). PMCC believes that the Sanctuary could be a leader in the move toward finer scale spatial management of the region’s fisheries. We recognize that, from an ecosystem perspective, the nearshore coastal environment presents a challenge to manage on fine spatial scales not encountered with offshore fisheries. The OCNMS management plan should include provisions for spatial management, including specific actions to be taken based on the latest fisheries science.
- There is an identity crisis with two National Oceanic and Atmospheric Administration (NOAA) agencies: the National Ocean Service, and National Marine Fisheries Service. What is the specific role of sanctuary? It is a great research mechanism.
- The sanctuary should stay back from the regulatory role of fisheries. It should conduct/coordinate research that contributes to the regulatory policies.
- The sanctuary should have a cooperative agreement on the state/tribes ecosystem initiative. This initiative will look at rockfish stocks on a regional basis and look at rockfish stocks in relation to mapped habitat. There is a need to help improve the objectivity of scientific research produced by all resource managers.
- Information available to the Pacific Fisheries Management Council (PFMC) could be augmented. Sanctuary could help with data-poor stock assessments to fill in data gaps.
- Ocean fisheries are being depleted – more research and regulation on fish stocks. More current stock data. Sanctuary should be an area of more intense study.
- Research on fish biomass should be provided to regulators.
- Would like the sanctuary to assist with rockfish stock assessments. Current efforts are insufficient.
- Work with the Washington Department of Fish and Wildlife (WDFW) to develop stock assessment of fish, especially yelloweye and canary rockfish. Coast-wide biomass assessment (Mexico to WA) not representative of regional abundance.
- Sanctuary should contribute, can take a lead with regional stock assessment to refine groundfish management.
- National Marine Fisheries Service (NMFS) science centers need help. Stock assessments are data poor. Sanctuary could have access to more resources to expand stock assessment efforts.

- Diversity of data sources would help to ground truth differences in results gained from different methods. Need to make sure data input into stock assessment models is reliable.
- Remotely-operated vehicles (ROVs) and other modern technologies should be used to improve stock assessment methods in conjunction with conventional techniques.
- For example, the sanctuary could facilitate stock assessment research by giving boat time or other means to help fisheries researchers to do their job.
- Rockfish assessment research should be expanded to areas that current methods have not captured (randomized transects within variable bottom contours): current methods are unable to access certain areas that some species tend to prefer or require
- There need to be regionally-based assessments of rockfish and not a coast-wide management.
- Where possible, provide data and information to fisheries management entities to improve stock assessments -- but in so doing, characterize the full life cycle of organisms and their habitat associations - to support sustainable fisheries.
- In addition to banning cruise ship discharges in the Management Plan the Sanctuary needs to rededicate itself to informing the public about the natural wealth that lies off the coast, enhance our region's ability to prevent and respond to oil spills and conduct research that helps to inform fisheries management rather than including fishing within the scope of regulations as you told the public when the Sanctuary was first designated.

10. HABITAT CHARACTERIZATION

- The sanctuary should do more work on deep-sea corals and deep-sea communities in order to monitor for climate change.
- Seafloor mapping should be 100% complete and assessment of benthic habitat which are important, especially deep coral.
- We need more geological research specifically focused on paleo-shoreline and sea level history over the past 20,000 years.
- Seafloor mapping and habitat characterization need to be high priorities.
- The sanctuary should continue habitat mapping in the sanctuary. This habitat mapping data also needs to be ground-truthed.
- The sanctuary should consider that habitat mapping data should support other ecosystem objectives, and not just support sanctuary or rockfish needs.
- The sanctuary should pursue an Intergovernmental agreement to declassify U.S. Navy maps and bathymetric data.
- Corals and living organisms that form seafloor habitats should be protected as best we can. These habitats regenerate very slowly after damage.
- A priority should be continuation of seafloor mapping and habitat classification programs. Mapping efforts should be completed.
- Would like public access to sanctuary's maps (e.g., bottom habitats). Would like improved charting for navigation safety. Suggest using sanctuary data to improve National Oceanic and Atmospheric Administration (NOAA) charts.
- Sanctuary should continue habitat mapping efforts. Get 'er done.
- Conduct and/or support those conducting analyses of existing data and identify data needs.
- The sanctuary should work together with the state, counties, port authorities, and the tribes to expand knowledge of habitat characterization. Collecting the data would help other initiatives such as siting of wave energy structures, ecosystem assessments, protection of essential fish habitat, etc...
- Sanctuary should conduct more mapping and habitat characterization within its boundaries.
- Need additional research on deep sea corals. Where they are, what they do, how they interact within the ecosystem.
- The sanctuary should develop data standards that provide for data and interpretation of the data to be translatable and available to resource managers in a timely fashion.
- We should survey the habitats and species to understand better what lives in the sanctuary and where. Habitat mapping is key.
- The sanctuary should make its data/research more accessible to the public and others.

- Further deep sea coral research – lack of data, need of more complete picture.
- Habitat mapping, developing response plan, continue and accelerate work
- Develop and adhere to a standard to making existing data translatable and available in a reasonable time period to inform resource management.
- Sanctuary should expand monitoring and characterization of all habitats within the sanctuary. We need to understand the habitat needs of all lifecycle stages.
- Sanctuary should undertake more coral biomass research – not just taking pictures of the resources but estimating the biomass of the coral resources, for example in areas not accessible to fishing gear as well as fished areas.
- Sanctuary should expand random transect video monitoring rather than site-specific video monitoring, in order to have a more representative picture of habitat, species composition, abundance, etc...
- Analysis of fisheries impacts or levels of impacts, what impacts have been sustained.
- Need a baseline for future monitoring. Sanctuary to help facilitate with agencies, academic, tribes and act as a clearing house. Coordinate a bi-annual symposium of knowledge of the sanctuaries, i.e., recent research results.
- Species research that captures trends and status of different types in the sanctuary. Research should focus on habitat conditions and habitat types, i.e., deep corals.
- Sanctuary needs to be doing more mapping of the seafloor habitat.
- The protection of newly found deep-sea coral is very important. The coral needs to be identified and protected. We also need to increase the area of sanctuary that is mapped, so that we know what we've got. There needs to be stewardship among all the users.
- The sanctuary should assist/support fisheries managers by doing research that helps managers (rather than managing fisheries itself). For example, seafloor mapping research could help fisheries managers.
- The need to continue mapping the sanctuary seafloor. Documenting the condition of existing habitats is a prerequisite for, among other things: minimizing the damage to deep-sea corals and sponges.
- Documenting the condition of existing habitats is a prerequisite for, among other things: getting baseline information to gauge the likely looming effects of climate change.
- Continuation of mapping and ground-truthing efforts should be given high priority, and the use of predictive models for extrapolation of data into unknown areas should be employed where possible.
- [Identify]to the best of our ability the current condition of habitats and resources – comprehensive habitat mapping will be key
- The sanctuary should pursue inner-governmental agreements or MOAs to declassify appropriate U.S. Navy maps and bathometric data.
- The sanctuary should consider that habitat mapping data support other ecosystem objectives, and not only support sanctuary or rockfish needs.
- Biodiversity conservation should include the following [issue]: The management plan should include continued undersea explorations to map the distribution of habitat-forming structures, such as deep-sea corals and sponges. . .
- The management plan should describe the Sanctuary's planned effort for seafloor mapping and habitat classification to cover the entire Sanctuary at high enough resolution to inform habitat-conservation decisions.
- Continue habitat mapping and baseline inventory of biota.
- Shoreline characterizations need to be completed for the development of an environmental sensitivity atlas that would be helpful in Natural Resource Damages Assessments as well.
- It seems unfortunate that NOAA has to spend its limited resources in mapping the bottom of the Sanctuary when the Navy already possesses these data but will not make them available and then prohibits NOAA from making their results public as well. NOAA needs to seek from the Navy an analysis of their bottom mapping that enables the Navy to protect classified information while allowing NOAA to better define the nature of the benthic habitat.

- We believe that there are several goals and objectives that the Sanctuary, together with its partnering agencies and the Tribes, should work toward. We . . . need to gather baseline data sufficient to measure change in marine resources within the boundary of the Sanctuary. From this, the Sanctuary can begin to develop an understanding of the distribution and quality of habitats and the role in which they function in the marine ecosystem.
- The Sanctuary should initiate work to characterize benthic habitats. The Sanctuary should determine to what extent the navy would be willing to share its data while protecting classified information.
- The management plan should include continued undersea explorations to map the distribution of habitat-forming structures, such as deep-sea corals and sponges. OCNMS researchers have surveyed only a small portion of the sanctuary, and there might be many undiscovered corals and other living structures in sanctuary waters that warrant protection.
- Only a quarter of the sanctuary's seafloor habitat has been mapped. . . The management plan should describe the sanctuary's planned effort for seafloor mapping and habitat classification to cover the entire sanctuary at high enough resolution to inform habitat conservation decisions.
- OCA calls for research on and implementation of the best methods for restoration of kelp forests in the OCNMS. Research should be conducted to identify the appropriate sites for restoration within the Sanctuary. Successful restoration methods used in California should be adapted for use in the OCNMS.
- Specifically, the draft management plan should include a plan to complete seafloor mapping and habitat classification throughout the sanctuary at high enough resolution to inform management decisions.
- Continue underwater explorations for habitat-forming structures, such as corals and sponges.
- Complete Seafloor mapping and habitat classification for the entire sanctuary at a high enough resolution to inform management decisions.

12. INVASIVE SPECIES

- Sanctuary should do more baseline monitoring especially in regards to invasive species and upland activities (examples: mineral extraction, logging, coastline development)
- Sanctuary should proactively address invasive species. For example, intertidal surveys should be conducted frequently enough to not let invasive species become established.
- Coordination among agencies is import role for sanctuary with regards to long-term monitoring and eradication of invasive species.
- Invasive species
- Invasive species – Are there any thoughts of a response plan for invasive species?
- Continue efforts to protect area from invasives
- I am concerned about the influx of invasive species, whether through ballast water or carried on currents. We now have 2 invasive *Spartina* species in Grays Harbor, and anticipate more pressure from seed carried north from Humbolt and San Francisco Bays. I would like to know if there are any plans to set aside funding for detecting and controlling invasive species?
- I support stronger fishing and harvesting restrictions within the Marine Sanctuary along with continued awareness and action regarding invasive species.
- Invasive Species monitoring needs to be conducted in a tiered response for early detection. Having a broad constant look and then a more focused approached routinely so that nothing slips in is important.
- You have a note about it but from having dealt with invasive *Didemnum* at the Underwater Park at Edmonds it is not something that can be handled hit or miss. I would encourage an intensive survey even if the density were one data point per square mile to understand the existing status.
- Identify, prevent, and remove invasive species.

14. LIVING RESOURCES MONITORING

- The sanctuary's future management plan should pay increased attention to living marine resources. Given their condition, attention to living marine resources should be an increased priority for the sanctuary.

- A priority of the sanctuary should be to establish with confidence what the status of the living marine resources is. Once we know this status, the sanctuary could act with more authority in managing the resources.
- The sanctuary should contribute to the understanding of the winter distribution of the endangered southern resident killer whale population.
- Study morbillivirus and toxoplasma in sea otters to determine its contagiousness.
- Expand upon current physical and biological parameter monitoring using remote ocean sensing devices (buoys) to provide baseline data and early warnings (e.g., harmful algal blooms). Integrate current deployments into Coastal Ocean Observing Systems, and partner with them.
- Increase knowledge on the presence, use and abundance in the sanctuary of threatened and endangered species. For example, study migratory pathways of hatchery and wild salmon.
- Monitoring should occur year-round (not just during good weather seasons), and should capture events that occur during the winter. For example, kelp monitoring in the winter is important in order to know what's coming for the spring.
- Check for parasitic algae on bull kelp, which is occurring in the central Sound.
- NOAA should use all of its observation assets (e.g., satellites) to the benefit of the national marine sanctuaries. Make this part of the management plan.
- The sanctuary should do more research on baseline levels of water column plankton larval fish and forage fish species. This data is needed for oil spill response and natural resource damage assessment.
- The sanctuary should initiate a stakeholder process to develop a shared set of species and habitats to be evaluated. Determine the conditions of those species and habitats and jointly develop strategies to protect them. Leverage partnerships and identify gaps.
- Continue surveying and monitoring efforts for long-term data sets on marine mammals, seabirds, kelp, etc. Existing monitoring programs need to continue and be identified as high priority items and not be terminated.
- A key role of the sanctuary is long term monitoring of living resources. Sites where long-term data is collected are needed. The sanctuary can serve this role by conducting and encouraging research and monitoring, and maintaining data and history.
- Research on predator biomass: seals, sea lions, pelicans.
- Local knowledge from fishermen should be used to help develop sanctuary research.
- Utilize local charter or commercial vessel operators for monitoring of baseline conditions. Create two-way communication process (e.g., email) to inform of changes in environmental conditions.
- There is a strong need to provide sanctuary data in a timelier manner and we need to identify the impediments that inhibit these reports from being produced and made available to other agencies and organizations.
- Conduct and/or support those conducting analyses of existing data and identify data needs.
- Need monitoring using remote sensing. More work with partnerships; agencies, tribes, non government organizations, and research institutions. To monitor physical changes and biological changes in the water of the sanctuary (e.g., harmful algal blooms - HABs).
- The sanctuary should develop data standards that provide for data and interpretation of the data to be translatable and available to resource managers in a timely fashion.
- We should identify to the best of our ability what is the condition of those resources.
- The sanctuary should make its data/research more accessible to the public and others.
- The sanctuary should act as a science based advisory panel and not implement belief based policy. Research that will fill data gaps in the transition to ecosystem based fisheries management. Specifics to include monitoring of apex predators, or sea otter-sea urchin dynamics. Conduct research that is mutually beneficial to tribes and the sanctuary. To be collaborators.
- Base line data – need data to make intelligent decisions for resources and managing resources.
- Marine bird assessment and why in decline.
- Develop a gap analysis about marine resources what we know and what we don't know. To inform management decisions. Example: Increases information for oil spills. Base line data.
- Develop and adhere to a standard to making existing data translatable and available in a reasonable time period to inform resource management.

- The sanctuary should set up a monitoring program to help with oil spill prevention that would monitor larval stages of rockfish and other groundfish species. To date, there is mainly risk assessment info on near shore species but no or little monitoring to assess damage to groundfish species, migratory species, recruitment, etc. Monitoring should be seasonal or even monthly.
- The sanctuary should increase research efforts and investigation on the marine survivability of all salmonid species in the ocean environment, with an emphasis on coastal species and/or ESA-listed species.
- The sanctuary should undertake genetic studies of salmonids passing through the sanctuary. There are species from other places (Columbia River basin, etc) that pass through the sanctuary and the sanctuary should study this occurrence: sanctuary may be critical habitat for certain species passing through, but we don't know that because we don't have the information.
- The sanctuary should support the installation of passive acoustic monitoring of killer whales or other marine mammals, similar to what has been done in Neah Bay.
- Sanctuary should do more in-depth monitoring of the non-native otter population effect on the resident urchin population: current urchin population may not be able to recover due to recent predation by otter population. Need to investigate and assess this issue.
- Sanctuary needs to commit itself to long-term monitoring of important parts of the food web. Should conduct review of protocols that can be conducted year after year so that these programs continue.
- Coordination with other agencies to get a better understanding of roles and responsibilities. Comprehensive understanding of research trends. Analysis of trends that have changed since the sanctuary designation. What improvements have occurred since designation?
- Need a baseline for future monitoring. Sanctuary to help facilitate with agencies, academic, tribes and act as a clearing house. Coordinate a bi-annual symposium of knowledge of the sanctuaries, i.e., recent research results.
- We need to better define the winter distribution of southern killer whales. Acoustic instrumentation on the coast to track the movements needed.
- To better understand the usage by gray whales of feeding areas. Improved characterization of mother-calf pairs during northern migrations.
- Natural Resource Damage Assessment (NRDA) near shore species characterization.
- When to use oil dispersant use matrix for responsible dispersant use
- The sanctuary needs an on-line database where the public can access data and information. This would better educate people about what the sanctuary is doing. It is difficult to access sanctuary data. If data was accessible on-line, it would lead to more transparency.
- Many observers of coastal issues would like to see more research directed to the use of the OCNMS by gray whales. It is especially important to understand the timing of the arrival of mothers and calves to the nearshore areas of La Push and the Makah . . . More information could shed light on how best to minimize disturbance to them by human activities.
- Though they may not yield useful results in the short term, long-term monitoring projects will be essential for OCNMS to understand how climate change affects its resources.
- Over the past 8 years I have had the privilege of working as a COASST volunteer . . . please continue and expand research in the Sanctuary. Track our birds, marine mammals, and sea life. Check our water quality and insure we are not injuring the marine populations . . .
- The Olympic National Marine Sanctuary is a joy to visit both on land and in the water as a diver. With the vast variety of flora and fauna makes this place a haven for both scientists and naturalist. There is a lot of research that needs to be done in this area and it would be very useful if the two would use an equivalent system enabling them both to use each others information for the betterment of the area.
- Provide equal opportunities for people to collect data for research. Provide different skill levels that can be checked and have equivalency with existing programs such as REEF, COASST, National Geographic Dive , Citizen Sciences, and Beach Watchers, However, NOAA, needs set the standard of each skill level that a person can learn with minimal training and then partake in collecting data or assist scientists.

- We must have programs in place that tell us how we are doing in trying to keep our waters clean and the inhabitants healthy so both plants and animals have the ability to live and prosper in a clean environment. There is so much we don't know and having programs like COASST, exploring the corals, keeping tabs on whale, otters, seals, birds and other wildlife is vital in helping us to protect these valuable natural resources.
- Continue surveying and monitoring efforts for long-term data sets on marine mammals, seabirds, kelp, etc. Existing monitoring programs need to continue and be identified as high priority items and not be terminated.
- Marine resource monitoring: although costly, resource monitoring is very important in the protection process . . . Initially this focus should be on baseline studies, species of concern and on indicator species/systems that are key to the overall health of the ecosystem while also measuring global warming.
- Winter is not a time to ignore the OCNMS. Yes conducting research in the winter is not always pleasant but the returns are important, as there are changes that occur and systems in place during winter that effect the entire year.
- Continue habitat mapping and baseline inventory of biota.
- Monitor sanctuary resources, including but not limited to species that are threatened, endangered, in decline, or that have been significantly impacted, and the food chain and physical conditions that support them.
- NOAA needs to invest in technology that would enable the Sanctuary to efficiently assess the seasonal occurrence of marine organisms in the water column for the development of a dispersant use matrix.
- Establishing a larval fish assessment monitoring program is also a top priority, as it will provide much needed insight into year-round water column vulnerabilities and can inform an oil spill dispersant decision matrix.
- Establish a near-shore baseline data monitoring program that includes surveying and quantifying invertebrate, macro-algae and rockfish populations.
- Design a year-round larval fish assessment protocol that meets the needs of all resource managers by acquiring technology such as In Situ Ichthyoplankton Imaging System (ISIIS) that allows for large coverage area while minimizing analysis time, and that incorporates fishing vessel operator participation where appropriate.
- Although costly, resource monitoring is very important in the protection process. Understanding the financial constraints of the sanctuary system, monitoring should be streamlined and focused. Initially this focus should be on baseline studies, species of concern and on indicator species/systems that are key to the overall health of the ecosystem while also considering global warming.
- OCA calls for research on the original natural distribution of kelp forests within OCNMS waters. This research should include documentation of tribal oral histories and examination for evidence of past kelp forests on existing and sediment covered rocky substrates.
- OCA recommends that the OCNMS increase biodiversity monitoring within the Sanctuary. Our understanding of the diversity of species existing in the biological web of life in the Sanctuary is necessary for an ecosystem management approach, focusing on ecosystem connections. We recommend that OCNMS focus on the lower ratings in the Condition Report.
- OCA recommends that the OCNMS enhance monitoring of orca and other marine mammals. Sonar buoy monitoring systems would be helpful in establishing marine mammal migration and feeding zones, so that they can be better protected within the Sanctuary.
- Expand the kelp monitoring program to include sampling designed explicitly to measure and characterize anecdotally observed changes.
- Begin monitoring the diversity and distribution of the other macroalgae that host the many fish and invertebrate species present in the nearshore.
- [A]necdotal evidence suggests a reduction in kelp beds near river mouths. The current [kelp] monitoring program does not include a sampling design detailed enough to measure these observed changes. If the kelp forests are indeed beginning to erode in these areas, the Sanctuary should ensure the ability to quantify this change through an adaptation to the monitoring program.

- Currently the only macroalgae that is monitored is kelp. There is an abundance of other macroalgae species including *Gracilariopsis Carcodiotheca* (*Neogagarhiella*), *Botroglossum*, *Prionitis*, *Desmerestia*, *Callophyllis*, *Gelidium*, *Gigartina*, *Nerocystic* and *Laminaria* that provide important habitat functions including substrate for the deposition of herring eggs, food and refugia for fish. The productivity and decomposition of macroalgae is important in nutrient cycling and influences nearshore water quality. A program that includes an initial survey to establish a baseline mapping in the density, distribution and diversity of the macroalgae as well as continued monitoring and analysis of changes from this baseline, could be used to assess the status of habitat and water quality at the Sanctuary.
- Expansion of the kelp monitoring program to: 1) capture the site scale changes that have been reported, 2) include a climate change modeling component, and 3) incorporate monitoring of additional macroalgae would significantly strengthen the Sanctuary's management plan. These changes would address two of the five priority topics to be addressed by the revised management plan_ *Characterization and Monitoring*, and *Climate Change*. Including an expanded macroalgae monitoring program as described above in the OCNMS Management Plan would allow for improved characterization of the Sanctuary resources, and the ability to more effectively respond to acute and long term environmental stressors.
- [Work with Olympic National Park to] inventory and monitor coastal and marine resources within park boundaries, determine baseline conditions, and detect abnormal changes in time to implement remedial actions.
- Many species of seabirds are in decline Washington Marine Waters. It is important to monitor the distribution and abundance of birds in the Sanctuary. What factors are influencing key bird food resources? Are changes in short term (last 10 years) meteorological conditions influencing nutrient dynamics and near shore productivity?
- The marine mammal and seabird surveys conducted in the Sanctuary are vital to understanding the health and dynamics of the area. Additionally, the citizen science Coastal Observation and Seabird Survey Team (COASST) program provides a unique means of monitoring the health of the sanctuary through the study of seabird mortality.

25. NON-POINT SOURCE POLLUTION

- The sanctuary should work on ways to incorporate or be mindful of activities going on upland of the sanctuary.
- Sanctuary should do more baseline monitoring especially in regards to invasive species and upland activities (examples: mineral extraction, logging, coastline development)
- Sanctuary should track and address stormwater runoff, upland erosion, and non-point source runoff pollutants because of their potential to have adverse impacts on the marine ecosystem.
- Near shore study needed to find out what type of land -use practices are used to impact Sanctuary resources: timber; future development; need baseline data.
- Work on land influences on marine ecosystems - the land connection, kelp etc.
- There is considerable deforestation along the south end of the OCNMS. I do not know of the OCNMS being part of the review process for any of this activity or notifying any property owner or subdivision that their actions have impacted the water runoff or water quality of the OCNMS - even in the cases where the trees have been completely removed from an adjacent mountain top or removed from the cliffs directly above the OCNMS.
- We would also like to see OCNMS have the ability to comment on land-based activities that affect the success of the Sanctuary in meeting its goals of ocean stewardship.
- OCA calls for increased research on the impact of Olympic Peninsula logging on sediment accumulation within the OCNMS and how this has affected kelp forests in the past and will affect restoration of kelp forests in the future.
- OCA recommends that the OCNMS increase research on bio-accumulative toxins in the Sanctuary. The deposition of toxins by air, water, and land into the west coast marine environment likely has significant long-term and cumulative impacts to the Sanctuary's biota and on the human populations that harvest Sanctuary resources for food. OCA encourages OCNMS to collaborate

with other agencies to increase our knowledge of the build-up of these toxins in the Sanctuary's water and biota.

- OCA recommends that the OCNMS increase research on sediment from terrestrial sources. As outlined in the Kelp and Sea Otter section, monitoring of sediment pollution from terrestrial sources is an important under-researched topic potentially impacting Sanctuary biota and habitats.
- Coordinate with upland managers to assess and minimize impacts from upland activities, including the disruption of natural shoreline processes and stormwater run off.
- Coordinate with upland managers to assess and minimize runoff from roads and coastal development.

32. RESEARCH TO SUPPORT ECOSYSTEM MANAGEMENT

- Research within the sanctuary needs to shift. Currently, research is focused on certain charismatic species. Monitoring should occur more on the community level (not just on certain species).
- A priority should be the scientific research and the data collected, including ecosystem parameters that the biological resources rely on, effects of pollutants from Puget Sound; water quality research, oceanic processes, dissolved oxygen and CO₂.
- Archeological sites contain information that can be used to understand the ecology of present systems which could help us with resource management (e.g., look at things in the past before management issues such as overfishing were occurring).
- Prioritize the research of cultural history from the period when sea level was low to help in the understanding of long-term change (cultural and natural history components).
- Reconstruct the trends in ecosystem change and human use over time.
- The sanctuary should consider that habitat mapping data should support other ecosystem objectives, and not just support sanctuary or rockfish needs.
- The sanctuary should initiate a stakeholder process to develop a shared set of species and habitats to be evaluated. Determine the conditions of those species and habitats and jointly develop strategies to protect them. Leverage partnerships and identify gaps.
- A program to monitor the interspecies dynamics of increased abundance warm water species such as tuna and pelican. How are these changes affecting the ecosystem and what are these species eating (stomach contents analysis)?
- The sanctuary should pursue a policy of ecosystem-based management, which should focus on interaction of all elements of ecosystems, including humans as element of the system.
- Monitoring program for near shore buoys should be expanded to record plankton and other water quality parameters at depth. Surface monitoring currently conducted does not fully address data needs, especially to identify issues such as ocean acidification.
- More research on indicators of ocean health. Examples: eelgrass, kelp forests, reefs.
- Need to know more about fishery resources to manage them sustainably.
- Key data needs are oceanographic and biological processes, for example larval transport, sink locations, habitat requirements.
- Fishery stock assessment studies should focus on species-habitat associations and depth preferences and differences in timing, tidal cycles, seasonal factors, etc. Stock assessments as now conducted do not accurately account for these preferences.
- Need to develop long-term monitoring and characterization program for marine resources within sanctuary utilizing ecosystem based management approach – full life cycle of organisms and habitat associations.
- The Pacific Fisheries Management Council (PFMC) and National Marine Fisheries Service (NMFS) northwest fishery science center have long-term research plans. These plans should be reviewed by sanctuary to potentially form partnerships for research. In the past they focused on single species and stock assessment. In the new research plans, they must ask whether there are regional differences in the stocks (where the fish lives, migrates, etc) when doing stock assessment. Now they need to ask “Is there a reason to manage stock differently in different regions?” The sanctuary should make sure that there is communication with fisheries researchers and that resources and data can be pooled together to help further our goals. What makes the

sanctuary special may create various habitats for different stocks of fish. The sanctuary can help fisheries managers with refining regional differences within stocks.

- More ecosystem protection assessment of dynamics – impacts by climate change, human interaction, natural variation – create baselines of species, and habitat (coral, kelp)
- Conduct ecosystem inventory and assessment and analysis by the Intergovernmental Policy Council (IPC) and the sanctuary. There is currently a lack of data and data integration.
- Support the development of new technologies to investigate marine ecosystems structure and function.
- The sanctuary should act as a science based advisory panel and not implement belief based policy. Research that will fill data gaps in the transition to ecosystem based fisheries management. Specifics to include monitoring of apex predators, or sea otter-sea urchin dynamics. Conduct research that is mutually beneficial to tribes and the sanctuary. To be collaborators.
- The sanctuary should conduct long-term research projects.
- Encourage the development of an outer coast atlas. Oceanographic currents, biotic resources, habitat mapping, monitoring, near shore cell circulation patterns
- Develop basic knowledge. Better understand basic mechanics of process.
- Cannot manage something that we do not know.
- Develop collaborative research to investigate seabirds as indicator species and indicator of ocean health. Need to better understand seabirds. Great indicator of trophic levels.
- Sanctuary should monitor long-term higher apex predator abundance as bio-indicator of ecosystem health (at least 5 years, but ideally 20 yrs).
- Understanding ecosystems dynamics. Refine a program to focus on physical parameters and biological populations in the near shore areas. Concerns with anoxia, upwelling and plankton-food web connections. Natural disturbance or influenced by anthropogenic influences such as meteorological conditions or climatic conditions. Concerns with effects on fisheries and seabird populations.
- Sanctuary needs to commit itself to long-term monitoring of important parts of the food web. Should conduct review of protocols that can be conducted year after year so that these programs continue.
- Synthesizing and integrating data from fish and wildlife, tribes and the National Marine Fisheries Service. The sanctuary or someone needs to be the integrator.
- Coordination with other agencies to get a better understanding of roles and responsibilities. Comprehensive understanding of research trends. Analysis of trends that have changed since the sanctuary designation. What improvements have occurred since designation?
- Understanding of keystone species and interspecies dynamics in the ecosystem
- Species research that captures trends and status of different types in the sanctuary. Research should focus on habitat conditions and habitat types, i.e., deep corals.
- Continued exploration of different habitats
- Research: there were a lot of question marks in the sanctuary's 2008 Condition Report. It would be a good thing to try and answer those questions/unknowns identified in the Condition Report. In particular, research is needed on the deep-sea trenches. Additional research is needed on the base of the food chain (krill etc.) – especially in light of anticipated effects of climate change.
- I'd like to see the sanctuary do its own independent research (instead of just piggy-backing on other programs). The only independent work seems to be on deep-sea coral.
- The sanctuary needs to do more research to back up its belief system/objective/mission.
- The sanctuary should assist/support fisheries managers by doing research that helps managers (rather than managing fisheries itself). For example, seafloor mapping research could help fisheries managers.
- The sanctuary needs to research the impacts of overabundance of marine mammals. What are the impacts on shellfish populations? What are the impacts on salmonids? What are the ecosystem-wide impacts on ecosystem structure and function?
- There needs to be hypothesis-based research done by the sanctuary.
- Continue research on birds, whales, and pollution
- Data collection and ongoing scientific research programs are important.

- Given the current expectations for global climate change, I believe that it would be a very good idea for the sanctuary to support more paleoenvironmental research. It may be possible to model and plan for possible changes. For example, there are several archaeological sites on the Olympic Peninsula that are associated with a relatively higher sea level than at present. The animal remains (and in one case so far, plant remains) in these archaeological sites can shed light on the nature of the marine environment in the area, when sea level is higher. The human/marine environment interaction can be traced through time, which will shed light on management issues (known archaeological records of more than 4,000 years of interaction). Research in non-archaeological sites (such as lake bottom sediments) can help separate the human and natural factors in the human/environmental interaction.
- [Survey] ocean conditions, physical habitats, species and species interactions to better understand what lives where, and how, within the sanctuary
- Where possible, provide data and information to fisheries management entities to improve stock assessments -- but in so doing, characterize the full life cycle of organisms and their habitat associations - to support sustainable fisheries.
- In addition to banning cruise ship discharges in the Management Plan the Sanctuary needs to reeducate itself to informing the public about the natural wealth that lies off the coast, enhance our region's ability to prevent and respond to oil spills and conduct research that helps to inform fisheries management rather than including fishing within the scope of regulations as you told the public when the Sanctuary was first designated.
- We believe that there are several goals and objectives that the Sanctuary, together with its partnering agencies and the Tribes, should work toward. First, we need to gather baseline data to better understand ecosystem interactions and conduct more research on multi-species dynamics, including the assessment of natural processes and human/cultural interactions with the environment.
- We believe that there are several goals and objectives that the Sanctuary, together with its partnering agencies and the Tribes, should work toward. We . . . need to gather baseline data sufficient to measure change in marine resources within the boundary of the Sanctuary. From this, the Sanctuary can begin to develop an understanding of the distribution and quality of habitats and the role in which they function in the marine ecosystem.
- Develop a long-term characterization and monitoring protocol in order to fill data gaps (both bottom up and top down) necessary for the development of ecosystem based fisheries management.
- OCA recommends that the OCNMS increase biodiversity monitoring within the Sanctuary. Our understanding of the diversity of species existing in the biological web of life in the Sanctuary is necessary for an ecosystem management approach, focusing on ecosystem connections. We recommend that OCNMS focus on the lower ratings in the Condition Report.
- [We recommend that the updated OCNMS Management Plan include] identification of Important Ecological Areas based on ecological criteria and the physical and biological features of the sanctuary (e.g. kelp forests, corals and sponge, rocky shores, critical habitat, and habitats important to marine life for breeding, feeding and shelter).
- Focus the monitoring program on collecting data that will enable NOAA scientists to answer key questions about the biological health of the Sanctuary. For example, there is a concern about the periodic occurrences of low dissolved oxygen (DO) in near shore waters of the Sanctuary. These occurrences have the potential to impact all aquatic populations as well as bird life. Are these low DO levels a result of natural conditions or from a build up of anthropogenic materials in the area? Are they the result of recent meteorological conditions which were different from long term historical conditions? Are recent meteorological conditions possibly the result of changes due to global climate change? There are many questions. OPAS would like to see NOAA identify the most important questions which relate to the health of the Sanctuary and then focus the monitoring program to collect the data that will allow them the best chance to understand these issues.
- Many species of seabirds are in decline Washington Marine Waters. It is important to monitor the distribution and abundance of birds in the Sanctuary. What factors are influencing key bird food

resources? Are changes in short term (last 10 years) meteorological conditions influencing nutrient dynamics and near shore productivity?

- Focus on summarizing data from an ecosystem approach. How do meteorological conditions, near shore water quality (including nutrients), and all trophic level biological populations relate to one another.
- Investigate ecosystem dynamics. Continue assessment of habitat types, plus the relationships between habitats, species and biological processes.
- Assess how the system is impacted by human activities, climate change, and natural variation.
- [U]nderstanding baseline conditions, ecosystem functions, and status and trends of biological and socioeconomic resources to effectively inform management should be a priority.

36. WATER QUALITY MONITORING

- A priority should be the scientific research and the data collected, including ecosystem parameters that the biological resources rely on, effects of pollutants from Puget Sound; water quality research, oceanic processes, dissolved oxygen and CO₂.
- Expand upon current physical and biological parameter monitoring using remote ocean sensing devices (buoys) to provide baseline data and early warnings (e.g., harmful algal blooms). Integrate current deployments into Coastal Ocean Observing Systems, and partner with them.
- Improve data acquisition, data management, and data sharing. Implement the Sanctuary Integrated Monitoring Network (SIMoN) at Olympic Coast National Marine Sanctuary.
- NOAA should use all of its observation assets (e.g., satellites) to the benefit of the national marine sanctuaries. Make this part of the management plan.
- Data collected by the sanctuary needs to be available to concerned parties in an electronic format – especially Geographic Information System (GIS) data. Data also needs to be processed and analyzed in a timely manner. Cooperative agreements could help insure the analysis gets done.
- Monitoring program for near shore buoys should be expanded to record plankton and other water quality parameters at depth. Surface monitoring currently conducted does not fully address data needs, especially to identify issues such as ocean acidification.
- Make funding available to organizations that conduct water quality testing. Example: Surfrider program for testing water quality.
- Local knowledge from fishermen should be used to help develop sanctuary research.
- Monitoring oxygen levels is important, as well as early notification of low levels. Work with local fishermen to enhance early reporting.
- Utilize local charter or commercial vessel operators for monitoring of baseline conditions. Create two-way communication process (e.g., email) to inform of changes in environmental conditions.
- Dead zones: O₂ levels effect crab, fish, and other habitat. Work with fishermen to improve knowledge, map affected areas, get information to/from fishermen.
- There is a strong need to provide sanctuary data in a timelier manner and we need to identify the impediments that inhibit these reports from being produced and made available to other agencies and organizations.
- Conduct and/or support those conducting analyses of existing data and identify data needs.
- Continue studies on ocean conditions on causes of oxygen depletion.
- Need monitoring using remote sensing. More work with partnerships; agencies, tribes, non government organizations, and research institutions. To monitor physical changes and biological changes in the water of the sanctuary (e.g., harmful algal blooms - HABs).
- The sanctuary should develop data standards that provide for data and interpretation of the data to be translatable and available to resource managers in a timely fashion.
- The sanctuary should make its data/research more accessible to the public and others.
- Research and monitor the deposition of airborne pollutants from Asia and marine vessel traffic.
- Develop and adhere to a standard to making existing data translatable and available in a reasonable time period to inform resource management.
- Low oxygen problem. Need continued focus, improved understanding of oceanographic and climate change linkages.

- Need a baseline for future monitoring. Sanctuary to help facilitate with agencies, academic, tribes and act as a clearing house. Coordinate a bi-annual symposium of knowledge of the sanctuaries, i.e., recent research results.
- The sanctuary needs to find a way to fund “spiders” on existing buoys that monitor ocean acidification. The degree of ocean acidification is extremely important to monitor.
- The sanctuary needs additional near shore monitoring buoys. That way, the sanctuary can get a bigger data set with which to assess ocean conditions.
- The sanctuary needs an on-line database where the public can access data and information. This would better educate people about what the sanctuary is doing. It is difficult to access sanctuary data. If data was accessible on-line, it would lead to more transparency.
- There is a new report on ecological conditions of coastal ocean waters along the U.S. western continental shelf, inclusive of the five west coast National Marine Sanctuaries. One of the major take-home messages of this report is that NOAA’s five NMSs along the West Coast of the U.S., including OCNMS, appeared to be in good ecological condition, based on the measured indicators, with no evidence of major anthropogenic impacts or unusual environmental qualities compared to nearby non-sanctuary waters. I am writing to bring your attention to this new report and to encourage you to make use of the results in your efforts to finalize the Sanctuary's management plan.
- Outreach occurs when you get partners that are in industry. Industry has resources that you can't afford and a desire to try them out to gain a competitive advantage. . . I see from page 24 of your Condition Report 2008 that vessel traffic is running the edge of the OCNMS and what an ideal chance to partner and outreach. Have sensors on the ships and have the ship lines as part of your team.
- My point is the citizen scientists can be partners. If salmon season is closed it is more fun to be out on a boat gathering data than sitting in port. Have a sampling rally.
- Advance the study, knowledge, and awareness of oxygen depletion - its causes, locations, consequences, and future threats.
- Study deposition and impacts from airborne pollutants.
- Sanctuaries should be places where basic long-term natural resource monitoring is done as a consequence of designation. At a minimum NOAA should be archiving their own satellite data to track seasonal changes in temperature and primary productivity in the nation’s 13 Sanctuaries, but this is not done. These data will enable the Sanctuary program to provide an archive of the impacts global climate change is having on our nation’s marine habitats.
- Increase monitoring capacity, through adding a NANOOS buoy within the Sanctuary, via in situ and satellite sensors to monitor the ocean's physical and biogeochemical properties, including carbon, nitrogen, current patterns, sea surface and sub-surface temperature, salinity, and acidity.
- Ocean acidification could be detrimental to calcifying organisms and potentially have ecosystem-altering effects, but the extent of ocean acidification is not being monitored in the sanctuary. With monitoring infrastructure already in place for many aspects of the sanctuary’s oceanographic conditions, the management plan should look into including the monitoring of pH changes in the sanctuary’s ongoing research program.
- [W]e encourage the sanctuary to continue monitoring water quality using mooring stations and to collect data to better understand global climate change induced impacts such as ocean acidification, temperature changes and hypoxic events.
- Continue to build partnerships for comprehensive monitoring and research on the issue of hypoxic events in the northern California Current. There is a clear need for near real-time data results to be readily available and useful to the research community.